4. Morphological and physiological characteristics

5. Mark/recapture studies

6. Biochemical techniques

The method that can give the clearest evidence of stock separation is mark/recapture studies (Gulland 1983). The ideal method is to tag in two areas simultaneously with potential return rates equal throughout the area of interest. Tagging studies can also determine migration patterns, and when and at which age fish occur in different fisheries that may be exploiting the same unit stock. Frequently, tagging projects are expensive and return rates are low, so combinations of other available data are used to help delineate separate stocks.

Catch Data - Data for the determination of trends, stock status, and fishery models come primarily from commercial fisheries, with additional data from recreational fisheries and fishery-independent surveys. Fishery-dependent data provide the greatest amount of data at the lowest cost to management agencies. These data are extremely important, but caution must be taken during data collection because it relies on subsampling and input from the non-scientific community, sometimes leading to inaccurate data. Types of data used by stock assessments collected from commercial and recreational fisheries include total catch, effort, and biological data.

Catch data must be a reliable estimate of the quantity harvested. All removals from a stock, including bycatch from other fisheries, need to be identified. Many times discards are ignored, leaving the full impact of fishing unknown (Gulland 1983). Although landings data are important, alone they can only indicate major changes in abundance, since the amount of fishing in many fisheries is greatly influenced by weather and market conditions.

The amount of fishing (effort) is a measure of the cost of fishing and of the fishing mortality coefficient. As with total catch, all effort on a stock needs to be identified. It is often difficult and impractical to derive total effort on a fishery, so effort is usually estimated from data on part of the fishery (Gulland 1983). Data needed to identify effort include craft specifications, areas fished, depth caught, gear type, and time fished (Caddy and Bazigos 1985). When effort data are available and the unit of effort for which the catchability coefficient is most nearly constant, it is possible to calculate on average catch-per-unit-of-effort (CPUE). This is one of the most vital population parameters, especially when fishery-independent data are not available. The CPUE can be used in a variety of analyses, including estimating changes in stock abundance (Ricker 1975). In most assessments some effort data will have to be used in the analyses.

Biological data from commercial and recreational fisheries are important to stock assessments by providing indicators of stock condition and in analyses and population modelling. These data include age, size (length and weight), sex, and others (Ricker 1975, Gulland 1983). Biological data are needed for each fishery affecting a stock. These data can be used to develop